**PCA with varimax rotation-to see what it does**

A factor analysis was run on a sample size of 500 participants from the National Education Longitudinal Study of 1988. The dimensionality of the three selected groups of items form variables (mathematics belief, mathematics classroom attitude and emphasis on mathematics) was analyzed using the principle components factor analysis. These criteria were used to determine the number of factors to rotate: the prior hypothesis that the measure was unidimensional, the scree test and the extraction method.

The scree plot indicated that the original hypothesis was incorrect. Based on the plot (Figure 1), four factors were rotated using the varimax procedure. The rotated solution (Table 1) yielded four interpretable factors. The extraction method used was Principal Component Analysis. There are 47 (34.0%) nonredundant residuals with absolute values greater than 0.05, which is acceptable.



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| **Table 1****Rotated Component Matrixa** |
|  | Component |
| 1 | 2 | 3 | 4 |
| f2s20c | .785 |  |  |  |
| f2s20d | .756 |  |  |  |
| f2s20e | .754 |  |  |  |
| f2s20a | .750 |  |  |  |
| f2s20b | .616 |  |  |  |
| f2s19bf |  |  |  |  |
| f1s63d |  | .912 |  |  |
| f1s63q |  | .911 |  |  |
| f1s63j |  | .894 |  |  |
| f1s63s |  | -.556 |  |  |
| f2s19bb |  |  | .862 |  |
| f2s19bc |  |  | .761 |  |
| f2s19ba |  |  | .573 |  |
| f2s19bd |  |  |  | .735 |
| f2s19bg |  |  |  | .644 |
| f2s19be |  |  |  | .602 |
| f2s19bi |  |  |  | .558 |
| Extraction Method: Principal Component Analysis.  Rotation Method: Varimax with Kaiser Normalization. |
| a. Rotation converged in 5 iterations. |

**FA with Principal Axis Factoring with oblique rotation, here you will try and determine the best model**

A factor analysis was run on a sample size of 500 participants from the National Education Longitudinal Study of 1988. The dimensionality of the three selected groups of items form variables (mathematics belief, mathematics classroom attitude and emphasis on mathematics) was analyzed using the principle axis factor analysis. These criteria were used to determine the number of factors to rotate: the prior hypothesis that the measure had three groups, the scree test and the extraction method.

The scree plot indicated that the original hypothesis was incorrect. Based on the plot (Figure 2), four factors were rotated using the Direct Oblimin procedure. The rotated solution (Table 2 & 3) yielded four interpretable factors. There is very little overlap within the groups. The extraction method used was Principal Axis Factoring . There are 8 (5.0%) nonredundant residuals with absolute values greater than 0.05.here are 47 (34.0%) nonredundant residuals with absolute values greater than 0.05, which is a good sign.



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| **Table 2****Pattern Matrixa** |
|  | Factor |
| 1 | 2 | 3 | 4 |
| f2s20c | .789 |  |  |  |
| f2s20d | .715 |  |  |  |
| f2s20e | .694 |  |  |  |
| f2s20a | .683 |  |  |  |
| f2s20b | .513 |  |  |  |
| f2s19bf |  |  |  |  |
| f1s63q |  | -.908 |  |  |
| f1s63d |  | -.904 |  |  |
| f1s63j |  | -.878 |  |  |
| f1s63s |  | .412 |  |  |
| f2s19bb |  |  | -.973 |  |
| f2s19bc |  |  | -.588 |  |
| f2s19ba |  |  |  |  |
| f2s19bd |  |  |  | .626 |
| f2s19be |  |  |  | .474 |
| f2s19bg |  |  |  | .439 |
| f2s19bi |  |  |  |  |
| Extraction Method: Principal Axis Factoring.  Rotation Method: Oblimin with Kaiser Normalization. |
| a. Rotation converged in 6 iterations. |

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| **Table 3****Structure Matrix** |
|  | Factor |
| 1 | 2 | 3 | 4 |
| f2s20c | .788 |  |  |  |
| f2s20d | .770 |  | -.433 |  |
| f2s20e | .696 |  |  |  |
| f2s20a | .695 |  |  |  |
| f2s20b | .510 |  |  |  |
| f2s19bf |  |  |  |  |
| f1s63d |  | -.905 |  |  |
| f1s63q |  | -.901 |  |  |
| f1s63j |  | -.884 |  |  |
| f1s63s |  | .407 |  |  |
| f2s19bb |  |  | -.912 |  |
| f2s19bc |  |  | -.644 |  |
| f2s19ba |  |  | -.427 |  |
| f2s19bd |  |  |  | .603 |
| f2s19be |  |  |  | .523 |
| f2s19bi |  |  |  | .445 |
| f2s19bg |  |  |  | .424 |
| Extraction Method: Principal Axis Factoring.  Rotation Method: Oblimin with Kaiser Normalization. |

**FA with maximum likelihood and oblique rotation, here you will try and determine the best model**

A factor analysis was run on a sample size of 500 participants from the National Education Longitudinal Study of 1988. The dimensionality of the three selected groups of items form variables (mathematics belief, mathematics classroom attitude and emphasis on mathematics) was analyzed using the maximum likelihood factor analysis. These criteria were used to determine the number of factors to rotate: the prior hypothesis that the measure had three groups, the scree test and the extraction method.

The scree plot indicated that the original hypothesis was incorrect. Based on the plot (Figure 3), four factors were rotated using the Direct Oblimin procedure. The rotated solution (Table 4 & 5) yielded four interpretable factors. There is a slight overlap in two of the factors. The extraction method used was Maximum Likelihood. There are 11 (8.0%) nonredundant residuals with absolute values greater than 0.05, which is also good.



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| **Table 5****Pattern Matrixa** |
|  | Factor |
| 1 | 2 | 3 | 4 |
| f1s63q | .905 |  |  |  |
| f1s63d | .898 |  |  |  |
| f1s63j | .892 |  |  |  |
| f1s63s | -.411 |  |  |  |
| f2s19bb |  | .988 |  |  |
| f2s19bc |  | .593 |  |  |
| f2s19ba |  |  |  |  |
| f2s20c |  |  | .785 |  |
| f2s20d |  |  | .713 |  |
| f2s20a |  |  | .671 |  |
| f2s20e |  |  | .666 |  |
| f2s20b |  |  | .535 |  |
| f2s19bf |  |  |  |  |
| f2s19bd |  |  |  | .640 |
| f2s19be |  |  |  | .464 |
| f2s19bg |  |  |  | .421 |
| f2s19bi |  |  |  |  |
| Extraction Method: Maximum Likelihood.  Rotation Method: Oblimin with Kaiser Normalization. |
| a. Rotation converged in 6 iterations. |

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| **Table 6****Structure Matrix** |
|  | Factor |
| 1 | 2 | 3 | 4 |
| f1s63d | .897 |  |  |  |
| f1s63q | .897 |  |  |  |
| f1s63j | .896 |  |  |  |
| f1s63s | -.406 |  |  |  |
| f2s19bb |  | .923 |  |  |
| f2s19bc |  | .650 |  |  |
| f2s19ba |  | .427 |  |  |
| f2s20c |  |  | .786 |  |
| f2s20d |  | .424 | .769 |  |
| f2s20a |  |  | .694 |  |
| f2s20e |  |  | .690 | .415 |
| f2s20b |  |  | .521 |  |
| f2s19bf |  |  |  |  |
| f2s19bd |  |  |  | .614 |
| f2s19be |  |  |  | .512 |
| f2s19bi |  |  |  | .434 |
| f2s19bg |  |  |  | .407 |
| Extraction Method: Maximum Likelihood.  Rotation Method: Oblimin with Kaiser Normalization. |

Just from looking at the three examples, the best method seems to be FA with Principal Axis Factoring with oblique rotation.

**For the IPOP data there are 38 items, 203 people, and one ID variable. The scale used for this Likert-type survey is “not me at all,” “a little me,” “me,” and “very much me.” For the analysis of IPOP you can choose the method and rotation etc. You are to come up with the best model and try to name the factors.**

I am torn between the two following methods: The first has more factors identified, but there is some overlap that makes the identification of factor names hard. The second method yielded only six factors, but a lot of the questions were left out of the factors because I left out coefficients under .4. When I changed it to .3, I got overlap again in a lot of the factors.

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A factor analysis was run on a sample size of 203 participants. The dimensionality was analyzed using the principle axis factor analysis. These criteria were used to determine the number of factors to rotate: the prior hypothesis that the measure had three groups, the scree test and the extraction method.

The scree plot indicated that the original hypothesis was incorrect. Based on the plot (Figure 4), six factors were rotated using the Direct Oblimin procedure. The rotated solution (Table 6) yielded six interpretable factors:

1. Insightfulness, Intellectual, Introvert
2. Social, Understanding, Extrovert
3. Physical, Kinesis, Nature
4. Creative, Critical Thinking
5. Technology, Information, Shopping
6. Abstract, Artistic

There is slight overlap in a few of the factors. The extraction method used was Principal Axis Factoring. b. Residuals are computed between observed and reproduced correlations. There are 71 (10.0%) nonredundant residuals with absolute values greater than 0.05.



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| **Factor Matrixa** |
|  | Factor |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ThinkAboutMyLife | .721 |  |  |  |  |  |  |  |  |  |  |  |
| InsightsIntoSelf | .709 |  |  |  |  |  |  |  |  |  |  |  |
| LearnPhilosophy | .677 |  |  |  |  |  |  |  |  |  |  |  |
| UnderstandPersonalityTypes | .613 |  |  |  |  |  |  |  |  |  |  |  |
| WriteInJournal | .551 |  |  | -.439 | .512 |  |  |  |  |  |  |  |
| AnalyzeSituations | .533 |  |  |  |  |  |  |  |  |  |  |  |
| KeepJournal | .507 |  |  | -.442 |  |  |  |  |  |  |  |  |
| SitAlone | .439 |  |  |  |  |  |  |  |  |  |  |  |
| MoviesMakeMeThinkAboutMyLife | .425 |  |  |  |  |  |  |  |  |  |  |  |
| KnowReasons | .415 |  |  |  |  |  |  |  |  |  |  |  |
| HelpOthers |  |  |  |  |  |  |  |  |  |  |  |  |
| TalkAboutFamilies |  | .679 |  |  |  |  |  |  |  |  |  |  |
| LeisureWithOthers |  | .654 |  |  |  |  |  |  |  |  |  |  |
| IdentifyPatterns | .414 | -.614 |  |  |  |  |  |  |  |  |  |  |
| EmotionallyConnectWithOthers | .424 | .591 |  |  |  |  |  |  |  |  |  |  |
| DivideIntoCategories |  | -.501 |  |  |  |  |  |  |  |  |  |  |
| BringPeopleTogether |  | .480 |  |  |  |  |  |  |  |  |  |  |
| HowThingsAreMade |  | -.467 | .434 | .442 |  |  |  |  |  |  |  |  |
| HowThingsWork |  | -.438 |  |  |  |  |  |  |  |  |  |  |
| Dance |  |  |  |  |  |  |  |  |  |  |  |  |
| BuyThings |  |  |  |  |  |  |  |  |  |  |  |  |
| Skateboard |  |  | .620 |  |  |  |  |  |  |  |  |  |
| TeachKidsSports |  |  | .597 |  |  |  |  |  |  |  |  |  |
| PlaySports |  |  | .566 | -.435 |  |  |  |  |  |  |  |  |
| ConstructThings |  |  | .546 |  |  |  |  |  |  |  |  |  |
| Camp |  |  | .471 |  |  |  |  |  |  |  |  |  |
| Ski |  |  |  |  |  |  |  |  |  |  |  |  |
| Run |  |  |  |  |  |  |  |  |  |  |  |  |
| YardSales |  |  |  |  | .472 |  |  |  |  |  |  |  |
| ShopEbay |  |  |  |  | .453 |  |  |  |  |  |  |  |
| ReadBios |  |  |  |  |  |  |  |  |  |  |  |  |
| PlayMusic |  |  |  |  |  |  |  |  |  |  |  |  |
| CollectSeashells |  |  |  |  |  |  |  |  |  |  |  |  |
| InspiredByNature |  |  |  |  |  |  | -.490 |  |  |  |  |  |
| MakeConceptMaps |  |  |  |  |  |  |  |  |  |  |  |  |
| Touchthings |  |  |  |  |  |  |  |  |  |  |  |  |
| LivingInThePast |  |  |  |  |  |  |  |  |  |  |  |  |
| ConstructArgument |  |  |  |  |  |  |  |  |  |  |  |  |
| Extraction Method: Principal Axis Factoring. |
| a. 12 factors extracted. 22 iterations required. |